

G. C. RICHARDS.

PUMP.

APPLICATION FILED MAR. 23, 1912.

1,051,260.

Patented Jan. 21, 1913.

2 SHEETS-SHEET 1.

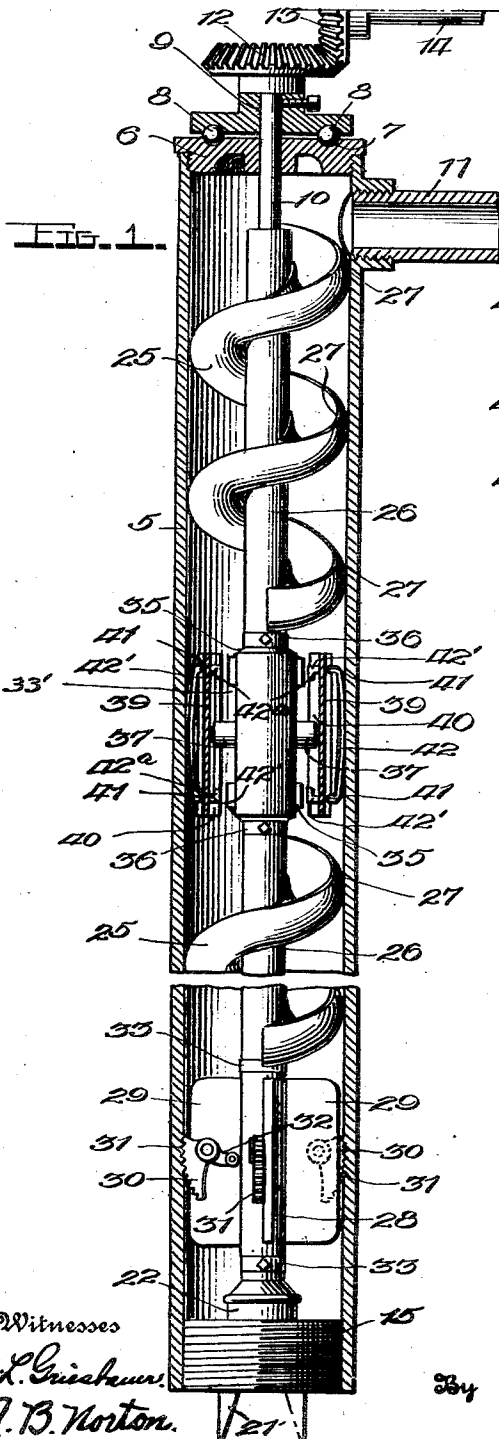


FIG. 3.

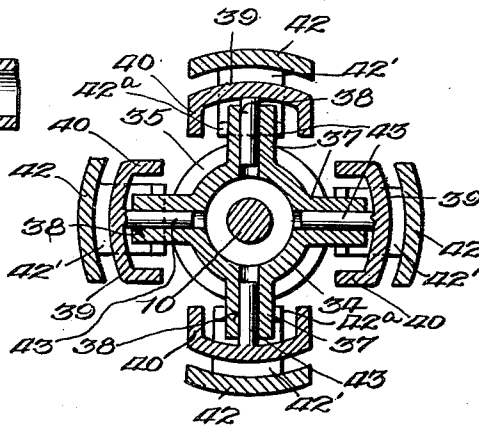
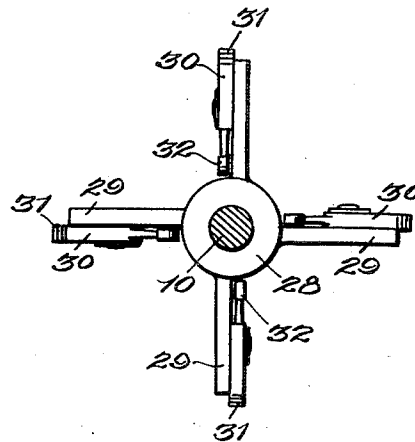


FIG. 2.



Witnesses

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George C. Richards,

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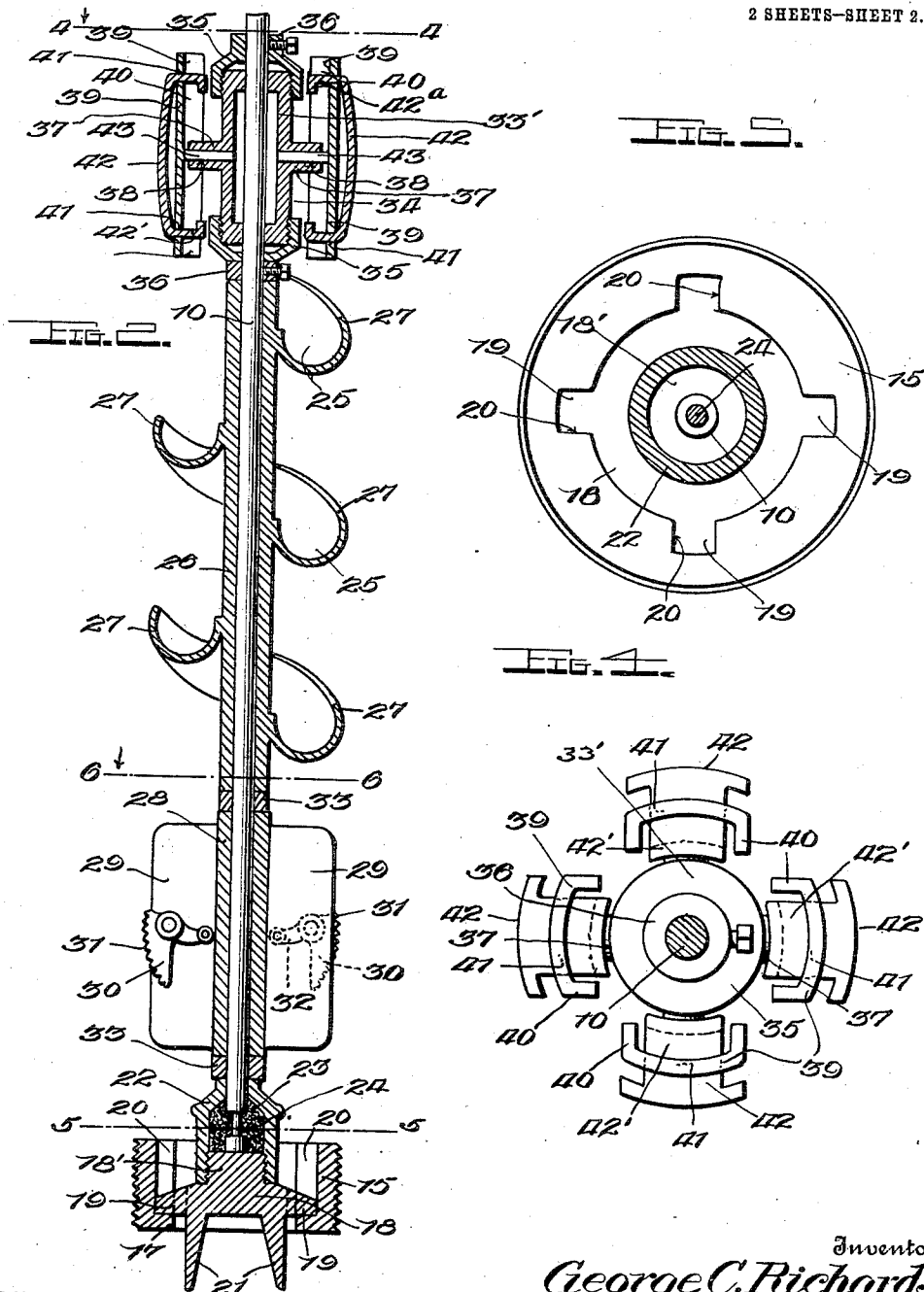
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Witnesses

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UNITED STATES PATENT OFFICE.

GEORGE C. RICHARDS, OF BERKELEY, CALIFORNIA.

PUMP.

1,051,260.

Specification of Letters Patent.

Patented Jan. 21, 1913.

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To all whom it may concern:

Be it known that I, GEORGE C. RICHARDS, a citizen of the United States, residing at Berkeley, in the county of Alameda and State of California, have invented certain new and useful Improvements in Pumps, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to improvements in pumps and has for its object to provide one or more spiral elevating blades arranged upon a rotary shaft mounted in the well casing, said blades being of such construction that the friction induced upon the walls of the casing in the upward movement of the water is reduced to a minimum, thus materially lessening the amount of power required to operate the pump.

Another object of the invention is to provide improved means for mounting the operating shaft in the well casing including a terminal bearing and one or more intermediate bearings together with a clutch device arranged on the shaft to grip the walls of the well casing and concentrically position the shaft therein, said supporting and positioning devices being so mounted and arranged upon the shaft that the same may be entirely removed from the casing upon the removal of the operating shaft.

A further object of the invention is to provide a terminal bearing for the operating shaft of novel construction whereby the liability of sand, gravel and other extraneous material finding its way into the bearing seat is practically eliminated.

A still further object of the invention resides in the provision of an operating shaft and a plurality of spaced elevating blades thereon, and bearings to position the shaft in the well casing arranged between the elevating blades, said bearings also acting to break up or divide the water and prevent its continued whirling motion so that it is more readily received and elevated by the upper spiral blade.

Another object of the invention is to provide a pump of the above character which is particularly designed for use in shallow wells and embodies in its construction many novel features which greatly increase its efficiency and convenience in practical use, while at the same time the entire device may be produced at comparatively small cost.

With the above and other objects in view, the invention consists of the novel features of construction, combination and arrangement of parts hereinafter fully described and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is an elevation of a pump embodying the present invention, the well casing being shown in section; Fig. 2 is an enlarged vertical section of one of the elevating blades, the clutch device and the terminal bearing for the lower end of the operating shaft; Fig. 3 is an enlarged detail section of one of the intermediate bearings; Fig. 4 is a section taken on the line 4—4 of Fig. 2; Fig. 5 is a section taken on the line 5—5 of Fig. 2; and Fig. 6 is a section taken on the line 6—6 of Fig. 2.

Referring in detail to the drawings 5 designates the tubular well casing, the upper end of which extends above the ground surface and is provided with a cap 6. The surface of this cap is provided with a raceway 7 to receive the ball bearings 8 which are disposed between the cap and a collar 9 fixed upon the operating shaft 10 which is concentrically disposed within the well casing and held in position by means to be later described in detail. To the upper end of the well casing 5 the fluid conducting pipe 11 is connected and is adapted to receive and convey the water discharged from the casing to a distant point where the same is to be utilized. To the upper end of the operating shaft 10 a beveled gear 12 is secured and a smaller gear 13 meshes with the gear 12, said latter gear being fixed upon the end of a power shaft 14 extending from an engine or other suitable source of power supply.

In the lower end of the well casing 5 a sleeve 15 is threaded and this sleeve is provided with an inwardly extending annular flange 17 which forms a seat for the bearing block or base 18, said block being provided with radially disposed lugs 19 to be received in the longitudinal grooves 20 formed in the inner peripheral wall of the sleeve 15. This bearing block is further provided with a plurality of depending spurs or tongues 21 which are adapted to be embedded in the hard rock at the bottom of the well. The block 18 is provided with a reduced threaded boss 18' which receives one end of a bonnet 22, the other end of said bonnet being tapered or reduced in diameter

and provided with an opening through which the lower end of the operating shaft 10 extends. Suitable packing material indicated at 23 is arranged within the bonnet 22 and the lower end of the shaft is reduced in diameter as at 24 to provide an annular groove forming a shoulder on the shaft. In this groove the packing material 23 is received whereby it will be readily seen that when the operating shaft is lifted, the bearing block or base 18 will also be lifted from the supporting flange 17 on the sleeve 15 so that said bearing is extracted with the shaft from the well casing.

Upon the operating shaft 10, two or more spiral elevating blades 25 are secured, said blades being provided with central sleeve portions 26 integrally connecting the several turns thereof, said sleeves receiving the operating shaft. These spiral blades are arranged in spaced relation upon the shaft as clearly shown in Fig. 1 and the same are preferably of concavo-convex form as clearly shown in Fig. 2, the concave surfaces of the blades being upwardly disposed. The extreme edges of the spiral blades which are disposed adjacent to the well casing are bent slightly inwardly as at 27 and act to direct the water inwardly and upwardly instead of outwardly against the walls of the casing. In this manner I aim to reduce to a minimum friction upon the walls of the well casing in the upward movement of the water caused by the rotation of said spiral blades.

In order to maintain the operating shaft 10 in its central concentric position within the well casing, I provide upon said shaft between the lower terminal bearing and the lowermost spiral blade 25 a clutch device which consists of a tubular sleeve or body 28 to receive the shaft upon which a plurality of radially disposed plates 29 are formed or rigidly secured. Upon each of these plates a cam member 30 is pivotally mounted, said members having toothed or serrated surfaces as indicated at 31 to exert a gripping action upon the inner wall of the well casing. These cam members are formed with arms or levers 32 to which the ends of strings or cords (not shown) are adapted to be connected. Collars 33 are fixed to the shaft at opposite ends of the sleeve 28 to hold said sleeve against longitudinal movement thereon. When the operating shaft is inserted into the well casing, the cam members 30 are held out of gripping engagement with the walls thereof by pulling upon the strings connected thereto as above mentioned. When the bearing 60 on the lower end of the operating shaft is seated upon the flange of the sleeve 15, the strings are broken to release the cam members whereupon the same move outwardly into gripping engagement with the walls of the casing 5. This clutch device serves as

an additional means of support for the shaft 10, the primary supporting means being embodied in the bearing at the upper end of the well casing.

In order to overcome all liability of contact between the edges of the spiral blades 25 and the well casing, I provide at intermediate points upon the operating shaft the additional positioning devices indicated generally by the numeral 33'. Each of these devices consists of a tubular body 34 loosely engaged at its end with the operating shaft, said body being provided at its upper and lower ends with tapered or conical caps 35 which serve as deflectors to prevent sand entering between the shaft and the ends of the body 34. Collars or washers 36 are also fixed upon the operating shaft at the upper and lower ends of said body to prevent its longitudinal movement. A plurality of radially extending arms 37 are arranged upon the body 34 and are longitudinally bored as shown at 38. These tubular outer ends of the arms are provided with plates 39 disposed in parallel relation to the operating shaft, said plates having inwardly extending flanges 40 on their longitudinal edges. The upper and lower end edges of the plates 39 are notched or recessed as at 41 to receive the inwardly disposed end portions 42' of the spring plates 42. The plates 39 carry pins 43 which are disposed in the bores 38 of the arms 37. The extreme ends of the plates 42 are preferably provided with lugs 42^a so that the same will retain their positions upon the plates 39 when the shaft and its bearings or supports are removed from the casing 5. These spring plates 42 are sufficiently strong to prevent lateral movement or vibration of the operating shaft in the well casing so that the edges of the spiral blades 25 are at all times maintained out of contact with the well casing.

By means of the above arrangement of shaft supporting and positioning devices, it will be readily seen that when the shaft is lifted and removed from the well casing, both the terminal bearing at the lower end thereof, the intermediate supports or bearings 33' and the clutch device at the lower end of the shaft are also removed bodily from the well casing. It is readily appreciated that such assemblage of the various parts which permits of their simultaneous removal will be of great convenience in practical use as it admits of the quick and thorough cleaning of all portions of the invention. The intermediate bearing members for the shafts having the arms 37 and plates 39 act to break up the whirling stream of water as it is passed from the lower to the upper spiral elevating blades 25 so that it more readily enters the lower end of the upper elevating spiral.

While the pump embodied in the foregoing description is primarily designed for use in shallow wells, it will be understood by those familiar with the art that many of the foregoing features may also be embodied in deep well pumps either for oil or water. It will also be understood that in putting the invention into practice, I do not desire to be limited to the precise number of spiral blades 25 shown in the drawing, as they may be multiplied as desired or found necessary in accordance with the conditions or use. Owing to the few parts employed and their simple construction, it will be seen that the same combine to produce a pump which is extremely durable and efficient in practical operation, and may be manufactured at comparatively small cost.

While I have shown and described the preferred construction and arrangement of the various elements, it will be obvious that the invention is susceptible of considerable modification without departing from the essential feature or sacrificing any of the advantages thereof.

Having thus described the invention what is claimed is:—

1. In a pump, the combination with a well casing, of fluid elevating means arranged therein including an operating shaft, a sleeve threaded into the lower end of said casing and having an inwardly projecting annular flange and longitudinal slots in the inner walls of the sleeve, and a terminal bearing for the lower end of said shaft connected to the shaft for removal therewith from the well casing, said bearing being provided with lugs to be received in the slots of said sleeve and adapted to rest upon the flange thereof.

2. In a pump, the combination with a well casing, of fluid elevating means arranged in said casing including an operating shaft, a terminal bearing for the lower end of said shaft provided with lugs, means for removably connecting the bearing to the shaft but permitting of the rotation of said shaft, and means arranged in the well casing for engagement by the lugs on said bearing to hold the bearing against rotation.

3. In a pump, the combination with a well casing, of fluid elevating means arranged

therein including an operating shaft, and a concavo-convex spiral blade arranged on said shaft and spaced at its edges from the wall of the well casing, the edges of said blade being inwardly and upwardly curved to direct the fluid away from the walls of the well casing.

4. In a pump, the combination with a well casing, of fluid elevating means arranged therein including an operating shaft, a plurality of spaced spiral blades arranged on said shaft, a plurality of radially disposed arms on the shaft between said spaced blades, plates mounted upon the ends of said arms and radially movable with respect to the shaft, and yieldable means mounted upon said plates to frictionally engage the wall of the well casing to maintain the edges of the spiral blades in spaced relation thereto.

5. In a pump, the combination with a well casing, of fluid elevating means arranged therein including an operating shaft, spaced spiral blades arranged on said shaft, a plurality of radially disposed tubular arms mounted upon the shaft between said spaced blades, and means movably mounted in said tubular arms including yieldable elements to frictionally engage the wall of the well casing and maintain the edges of the spiral blades in spaced relation thereto.

6. In a pump, the combination with a well casing, of fluid elevating means arranged therein including an operating shaft, spaced spiral blades arranged on said shaft, a plurality of radially disposed tubular arms mounted upon the shaft between said spaced blades, plates disposed in parallel relation to the shaft and provided with pins removably disposed in said tubular arms, and bowed spring plates having their ends loosely engaged with said first named plates and adapted for frictional engagement with the wall of the well casing to maintain the edges of the spiral blades in spaced relation thereto.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

GEORGE C. RICHARDS.

Witnesses:

CHAS. A. RICE,
HOWARD J. PEIRSOL.